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AUSTRALIA

*Patents Act 1990*

PATENT REQUEST: STANDARD PATENT/PATENT OF ADDITION

We, being the persons identified below as the Applicant,  
request the grant of a patent to the person identified below  
as the Nominated Person, for an invention described in the  
accompanying standard complete specification.

Full application details follow.

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[7C]	Nominated Person:	DIE-CRAFT ENGINEERING PTY LTD
	Address:	37 Colebard Street West, Archerfield, Queensland, 4108, Australia
[54]	Invention Title:	METHOD OF MANUFACTURE OF BUILDING FRAMING
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ASSOCIATED PROVISIONAL APPLICATION(S) DETAILS

[60] Application Number and Date: PL8296 filed 15th April  
1993

Drawing number recommended to accompany the abstract: FIG 4

DATED this Twenty-second day of December 1993

DIE-CRAFT ENGINEERING PTY LTD

by:



Registered Patent Attorney

TO: THE COMMISSIONER OF PATENTS  
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## NOTICE OF ENTITLEMENT

(To be filed before acceptance)

I/We, DIE-CRAFT ENGINEERING PTY LTD  
..... ACN/ARBN .....  
of 37 Colebard Street West, Archerfield, Queensland, 4108, Australia  
.....  
being the applicant in respect of Application No. .... filed herewith ....., state the following:-

Part 1 - Must be completed FOR ALL APPLICATIONS.

The person(s) nominated for the grant of the patent:

~~\*is/~~ \*are the actual inventor(s)

or

\*has entitlement from the actual inventor(s) by virtue of the fact that the actual inventor is employed by the applicant and hence would be entitled to have any patent granted on this application assigned to him.  
(eg by assignment, by mesne assignment, as legal representative of ....., etc)

~~\*Part 2 - Must be completed IF THE APPLICATION IS ASSOCIATED with one or more  
PROVISIONAL APPLICATIONS.~~

~~The person (s) nominated for the grant of the patent:-~~


~~\*is/~~ \*are the applicant(s) of the provisional application(s) listed on the patent request form

~~or~~

~~has entitlement to make a request under Section 113 in relation to the provisional application(s) listed on  
the patent request form~~

~~(eg by assignment, by agreement, etc)~~

Signed on and behalf of the  
applicant DIE-CRAFT ENGINEERING  
PTY LTD

by  Robin T Kelly 22nd December 1993  
(Signature) Patent Attorney - Fisher & Kelly (Date)  
(If the applicant is a Company or other legal entity, also indicate the name and standing of the authorized signatory.)

\* Omit/Delete if not appropriate

Note: Use form P/00/008b where details for PCT, convention priority, microorganism deposit, additional or divisional application, are required.



(12) PATENT ABSTRACT (11) Document No. AU-A-52665/93  
(19) AUSTRALIAN PATENT OFFICE

(54) Title  
METHOD OF MANUFACTURE OF BUILDING FRAMING

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(57) Claim

1. A method of manufacture of framing for building construction which includes the steps of:

- (i) designing a plan for a building frame having a plurality of frame members each having predetermined dimensions;
- (ii) manufacturing said building frame comprising said plurality of frame members which are each cut to conform with the dimensions of step (i); and
- (iii) assembling each of said frame members to form said building frame.

14. A building frame formed by a plurality of frame members all having the same transverse dimension and cross sectional shape wherein one or both ends of each frame member are crimped or otherwise provided with end attachment means so as to be retained in close proximity or in abutting relationship with a

supporting frame member.

15. A bundle of frame members in a relatively compact form wherein each of said frame members have been cut to a required length in accordance with dimensional data applicable to a wall frame.

AUSTRALIA

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ORIGINAL  
COMPLETE SPECIFICATION  
STANDARD PATENT

Invention Title: METHOD OF MANUFACTURE OF BUILDING FRAMING

The following statement is a full description of this invention, including the best method of performing it known to us:

THIS INVENTION relates to a method of manufacture of framing for building construction and in particular to a method of construction of framing including individual building frames for ultimate incorporation  
5 in a building such as a house, garage, shed or commercial building such as a factory or office block. In particular the invention is specifically directed to manufacture of wall frames and roofing frames inclusive of trusses and gable frames.

10 It is commonplace in building construction to construct pre-fabricated wall frames at a factory or other location remote from a construction site and transport the wall frames to the construction site whereafter they may be removed by cranes to a concrete  
15 slab and attached to the concrete slab by anchor bolts or anchor clips. In this method a complete wall framing assembly may be erected in situ on the concrete slab and thereafter a roof framing assembly attached to the wall framing assembly. Usually the  
20 roof framing assembly may comprise a plurality of pre-fabricated trusses and gable assemblies which may be attached to each other in situ to form the roof framing assembly.

Wall frames in many cases are formed from steel  
25 and currently a conventional method of producing wall frames is to initially produce a number of individual frame members on roll forming machines. Such frame members include a plurality of top plates, bottom

plates, studs and nogging members which were then sorted into separate individual piles or racks so that a first rack comprised top or bottom plates, a second rack comprised studs, a third rack comprised nogging members, and a fourth rack comprised more specialised frame members such as sills or heads or braces.

Subsequently the wall frame members in "stick form" were then assembled on welding jigs and welded together to make wall frames which could then be transported to the construction site. In one situation the production of the separate frame members were carried out by a roll forming manufacturer who then sold the frame members in separate racks of "sticks" to an end user such as a steel frame manufacturer. In another situation the entire operation was carried out by the steel frame manufacturer. In each of these situations some of the frame members or "sticks" were reprocessed by the steel frame manufacturer such as cutting sticks into desired lengths or carrying out hole punching operations as may be required by the builder or architect who established specifications for each of the wall frames to be utilised in the building at the construction site.

The abovementioned conventional methods of manufacture of wall frames especially when such wall frames were formed from steel were found to be disadvantageous in cost because there was no control



on builders specifications which were determined by the builder or architect at the construction site. This led to some of the reprocessing steps discussed above. Also there was a high percentage of wasted  
5 time or "down time" associated with current methods of manufacture because frame members were not produced in a form required by the builder or architect.

It therefor is an object of the invention to provide a method of framing for buildings which may  
10 alleviate the abovementioned disadvantages.

The method of the invention includes the following steps:

- (i) designing a plan for a building frame having a plurality of frame members each having  
15 predetermined dimensions;
- (ii) manufacturing said building frame comprising said plurality of frame members which are each cut to conform with the dimensions of step (i); and
- 20 (iii) assembling each of said frame members to form said building frame

It will also be appreciated that while the invention is described hereinafter in relation to wall frames, it may be utilised in relation to other  
25 building frames such as roofing frames inclusive of gable frames or trusses.

Suitably in step (i) a building framing assembly is designed by a builder or architect comprising a

plurality of wall frames which are assembled together as indicated by plans or specifications whereby individual frame members such as heads, sills, lintels, architraves, studs, top plates, bottom plates and other frame members are each provided with certain predetermined dimensions. For example, a house plan after having been designed and costed by an architect may then be submitted to the local regulatory authorities such as local government agencies such as councils. The house plan may have been computer generated for the local council and from such plans a series of separate wall frames or modules may be produced comprising a top plate, bottom plate, plurality of studs, and head and sill if a window aperture is included in the wall frame.

From the computer generated plan there also may be produced a computer generated "cut list" which may operate a conventional roll forming machine so as not only to produce individual frame members but which may also cut each frame member to the desired length as shown on the house plan.

In relation to the process which may produce the frame members it is preferred that each frame member be provided with a similar cross sectional profile which may be of any suitable shape having the same dimensions. Examples of such a shape may be rectangular, round or polygonal which formed closed shapes. However, more preferably each frame member is

provided with a non closed shape such as a channel shape which may be a V shape, U shape, or even a double channel or W shape, Preferably a U shape is provided whereby the web and the two uprights or  
5 opposed flanges of the U are normal to each other.

However, suitably in accordance with the invention, the roll forming machine or other machine which may profile each frame member as described above may be computer operated in accordance with the  
10 aforementioned "cut list" so that only those frame members corresponding to a particular wall frame are produced at the same time.

Suitably for example each wall frame comprises frame members all having the same or similar cross sectional or transverse dimensions so that for  
15 example, the same size channel section is used. It is also preferred that each frame member be further processed so that each frame member may be located in abutting relationship or close proximity with each  
20 other prior to assembly. This step facilitates a ready fit between for example, studs and nogging members and top or bottom plates as may be required. In one form this may be accomplished by each channel frame member having crimped ends so as to be retained  
25 between opposing flanges and a web of supporting channel members so that for example, studs at spaced intervals may be accommodated readily in top and bottom plates in abutting relationship. In a

variation on this, each wall frame member at each end may be provided with a socket or plug so as to be retained within a mating plug or socket of supporting frame members. In yet another variation, each frame member may have profiled ends e.g. of corrugated shape which may be slidably retained in supporting frame members having a complementary or mating profile. In another variation each frame member may be provided with an attachment tab or protrusion so as to be welded to a broad surface of an adjacent frame member.

Subsequently as the relevant number of frame members are produced which correspond to an individual wall frame they may be then stacked or bundled together to correspond to the individual wall frame which has already been included in the initial house plan. The frame member may then be placed in an assembly jig or welding jig at the factory which also includes the roll forming machine or sent to another frame fabricator in the form of bundled modules for subsequent assembly or fabrication. In yet another option the frame bundles may be sent to the building site for subsequent assembly or fabrication by the builder in situ.

The wall frames may then be assembled together in any suitable manner such as by welding, the use of fasteners such as staples, rivets, or screws engaging in predrilled holes or by use of any other suitable attachment means.

Reference may now be made to a preferred subodiment of the invention shown in the attached drawings wherein:

FIG 1 is a view of a wall frame intended for inclusion in a building which has individual dimensions which have already been allocated to relevant frame members from the initial building plan; such wall frames are typical computer frame design layouts, which may be passed to the computer operating the roll forming machine for subsequent processing of the frame members;

FIG 2 is a view of another wall frame as described above in relation to FIG 1;

FIG 3 illustrates a perspective view of a crimped end of a wall frame member which may be used in the method of the invention;

FIG 4 is a perspective view of a wall frame produced by the process of the invention;

FIG 5 shows a detailed view of the attachment or assembly of a crimped end of a stud within the confines of a retaining top plate;

FIG 6 shows a detailed view of the attachment or assembly of a nogging member to an adjacent stud wherein the nogging member is provided with an attachment plate or tab so that the nogging member may be welded to an adjacent surface of a web of an adjoining stud;

FIG 7 is a similar view to that described above

in relation to FIG 6 showing a different form of attachment wherein a nogging member is provided with a crimped end as shown so as to engage with a mating U shaped support bracket already welded to an adjacent stud;

FIGS 8-9 are a perspective view and plan view of the attachment of a nogging member to an adjacent stud;

FIGS 10-10A are a perspective view and detailed end view of a bracing member and the attachment of the bracing member to an adjacent nogging member; and

FIGS 11, 12 and 13 show various cross sectional profiles of frame members for use in the method of the invention.

In FIG 1 there is shown wall frame 9 having top plate and bottom plate 10, top studs 11, eight full length studs 12, bracing members or struts 13 and 14, nogging members 15 and 16 and 17, and head 18. The cross sections of each of the studs are also indicated below each stud.

Typically wall frame 9 may have dimensions as indicated on a "cut list" as follows:

WALL NUMBER		
MEMBER	LENGTH (MM)	NO.
25 PLATE	4425	2
STUD	345	4
	2445	8
HEAD/SILL	2775	1

5	HEAD STRUT	641	1
		653	4
	NOGGING	286	1
		324	1
		445	2
	FRAME WEIGHT	48KG	

In FIG 1, top studs 11 have the length of 345 mm, head strut 13 has the dimension of 641 mm with the other struts having the dimension of 653 mm, nogging member 16 has the dimension of 445 mm, nogging member 15 has the dimension of 286 mm and nogging member 17 has the dimension of 324 mm.

In the CAD drawing of wall frames 9 shown in FIGS 1-2 the dimensions as referred to above will normally also be depicted on the drawing in the usual manner in the case of engineering drawings.

In FIG 2 there is shown another wall frame 9A having top and bottom plates 20, top studs 21, bottom studs 21A, studs 22 of full length, head struts 23, upper diagonal braces 24 and 24A, lower diagonal braces 25, head 26, sill 27 and nogging members 28, 29, 30 and 31.

Typically wall frame 9A may have dimensions as indicated on a "cut list" as follows:

25	<u>WALL NUMBER</u>		
	MEMBER	LENGTH (MM)	NO.
	PLATE	4347	2
	STUD	320	3

	870	3
	2445	8
HEAD/SILL	2100	2
DIAGONAL BRACE	1020	2
5	1658 (24)	1
	1668 (24A)	1
HEAD STRUT	615	4
NOGGING	445 (31)	1
	513 (29)	1
10	544 (30)	1
	595 (28)	1

Each of the wall frames 9 and 9A are obtained from the building plan or house plan by the use of appropriate computer software. The "cut lists" as described above may also be computer generated or obtained manually.

However, in an appropriate data file all of the above mentioned information may be stored for use as required. Additional information such as the location of holes for electrical or plumbing fittings may also be stored as well as whether the ends of the frame members are crimped or uncrimped as described above.

The "cut list" may be inputted manually into a computer operating the rollforming machine or may be inputted automatically using the data file.

The roll forming machine may then produce each of the required frame members per wall frame or wall



module. The adoption of the same cross sectional size for each frame member enables the machine to operate continuously to produce all the relevant frame members.

5        This is in contrast to conventional procedures where a member of roll forming machines may be utilised where one machine may produce plates, the second machine studs and the third machine nogging members which after they are produced are all bundled  
10       together.

      In relation to conventional procedures it was customary for the cross sectional size of the different frame members to vary. For example, the top and bottom plates were generally slightly larger in  
15       width than the studs so that the studs could be accommodated with the top and bottom plates. The nogging member were generally slightly less in width when compared to the studs so that they could be accommodated within the studs.

20       It was also customary for the studs to be supplied in 6-7 metre lengths with the plates and nogging members to be supplied in relatively long stock lengths so that they could be cut to size as required for a particular wall frame.

25       If a single roll forming machine was to supply a number of plates, then a number of studs followed by a number of nogging members it was then necessary to vary the operating width of the rollers by the use of

spacers or other suitable technique.

There is also shown TABLES 1, 2 and 3. In TABLE 1 there is shown a conventional method of steel framing manufacture wherein a variety of steel framing members such as top and bottom plates, studs and  
5 nogging members are produced on a number of roll forming machines wherein the individual frame members are racked or stored whereafter the frame members are sold as "sticks" to the frame manufacturer who  
10 subsequently manufactures the frame in welding jigs. In TABLE 2 another conventional method of steel framing manufacture is shown where again individual frame members are racked or stored separately after being produced from a number of rollforming machines  
15 before the frames are assembled in welding jigs.

Both of the conventional methods as shown in TABLES 1 and 2 are for the primary purpose of manufacture in "stick form" or as individual frame members. In either case some of the product sticks  
20 may have to be re-processed by the frame manufacturer. This is mainly in the form of cut to length or hole punching operations and is a direct result of the need to cut the wall frame to required specifications which will be required to produce wall frames as shown in  
25 FIGS 1-2.

In contrast a preferred embodiment of the invention is shown in TABLE 3 wherein initially a house or building plan is selected and costed before

plans are drawn which may be computer generated for the local statutory authority or council or even drawn manually if need be. From such plans wall frame modules may be produced as shown in FIG 1 as well as a  
5 computer generated "cut list" for use on a rollformer mill or machine. The rollformer mill may then produce a module wherein all framing members of the module are produced by the mill at the same time allowing the fabricator to manufacture the wall frame from the  
10 custom made framing members or allowing the bundle of individual custom made frame members to be welded in a welding jig by another fabricator or even an owner builder.

In FIG 3 there is shown one of the individual  
15 frame members 40 produced in accordance with the invention having a crimped end 41 wherein opposed flanges 40A of channel member 40 are inwardly turned at 40B to provide end flanges 40C of narrower transverse dimensions so as to ensure a suitable fit  
20 between top and bottom plates, studs or nogging members.

In FIG 4 there is shown a wall frame 42 produced by the method of the invention including top plate 43, bottom plate 44, studs 45, head studs 46, sill studs  
25 47, head 48, sill 49 and braces 51-52 and nogging members 53. Each frame member is of a channel cross sectional shape as described hereinafter.

FIG 5 shows a detailed view of section "A" shown

in FIG 4 whereby stud 45 is provided with a crimped end 41 so as to be securely retained within channel 46 of top plate 43.

5 In FIG 6 there is shown nogging member 53A having a tab 54 welded thereto which may be attached to web 55 of stud 45 also having opposed flanges 56.

In FIG 7 there is shown in an alternative form of engagement nogging member 53B having a crimped end 41 for which may engage in channel bracket 57 welded to  
10 web 55 of stud 45.

In relation to FIGS 8-9 there is shown an alternative system for attachment of nogging members 53 to studs 45 wherein each nogging member 53 is provided with opposed extensions or tabs 58 which are  
15 outwardly turned at 59 so as to engage with opposed flanges 56 and web 55 of stud members 45. There also shown fasteners 60 such as rivets.

In regard to FIGS 10-10A diagonal bracing members 51 at each end thereof may also be provided with  
20 opposed extensions or tabs 58 which are outwardly turned at 59 so as to engage with opposed flanges 56A and web 55A of nogging member 53. Nogging member 53 in FIG 10 may also be provided with a crimped end 41.

In FIGS 11-13 there are shown various cross  
25 sectional shapes of frame members that may be utilised in the method of the invention. The channel member 40 shown in FIG 11 is provided with a pair of opposed flanges 40A which are bent outwardly at 40D so as to

provide free ends 40E of greater transverse dimension. This facilitates nesting of adjacent frame members 40 for purposes of reinforcement if desired as shown in FIG 13. FIG 10 illustrates an alternative channel member 40 where each opposed flange 40A are normal to web 40E.

From the foregoing it therefore will be appreciated that the framing method of the invention allows for frames to be

- 10 (1) produced in a rolling mill as single frames and assembled directly onto a frame jig;
- (2) produced in the rolling mill as single frames and bundled as single frames for others to assemble either in their own
- 15 factory or on site; or
- (3) produced in the rolling mill as single frames and bundled as single frames for export to other markets in a compact form.

In a further aspect of the invention there is provided a building frame formed by a plurality of frame members all having the same transverse dimension and cross sectional shape wherein one or both ends of each frame member are crimped or otherwise provided with end attachment means so as to be retained in

20 close proximity or in abutting relationship with a supporting frame member.

In a further aspect of the invention there is provided a bundle of frame members in a relatively

compact form wherein each of said frame members have been cut to a required length in accordance with dimensional data applicable to a wall frame.

TABLE 1

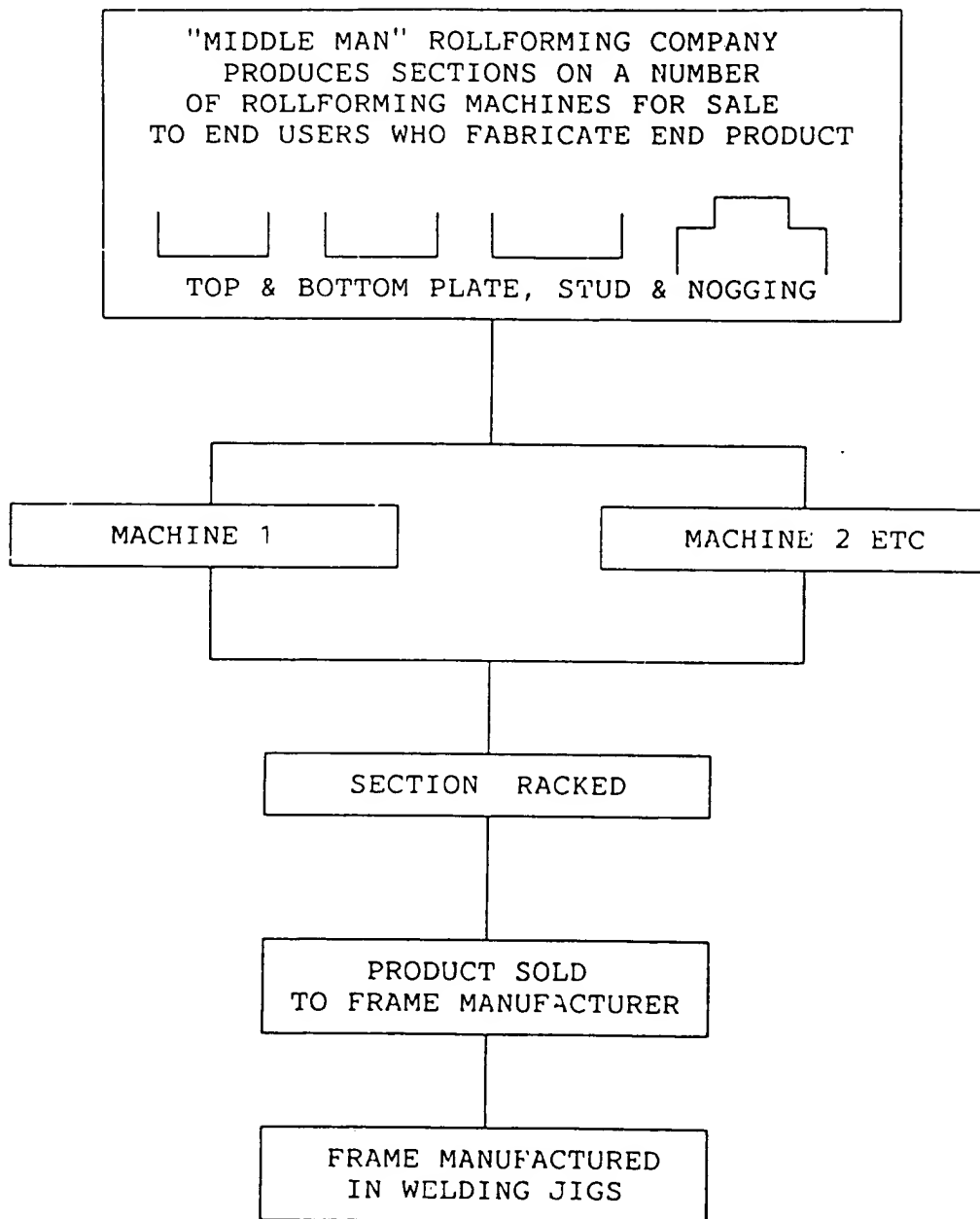


TABLE 2

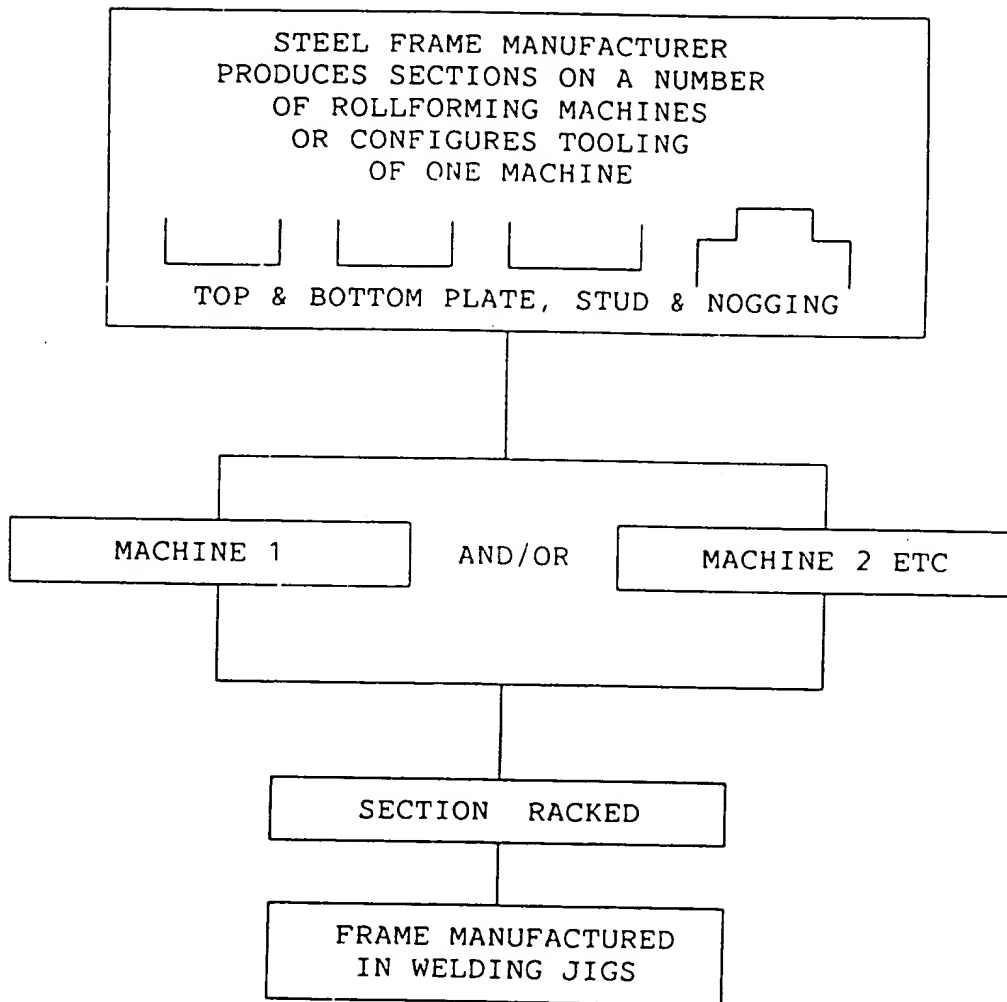
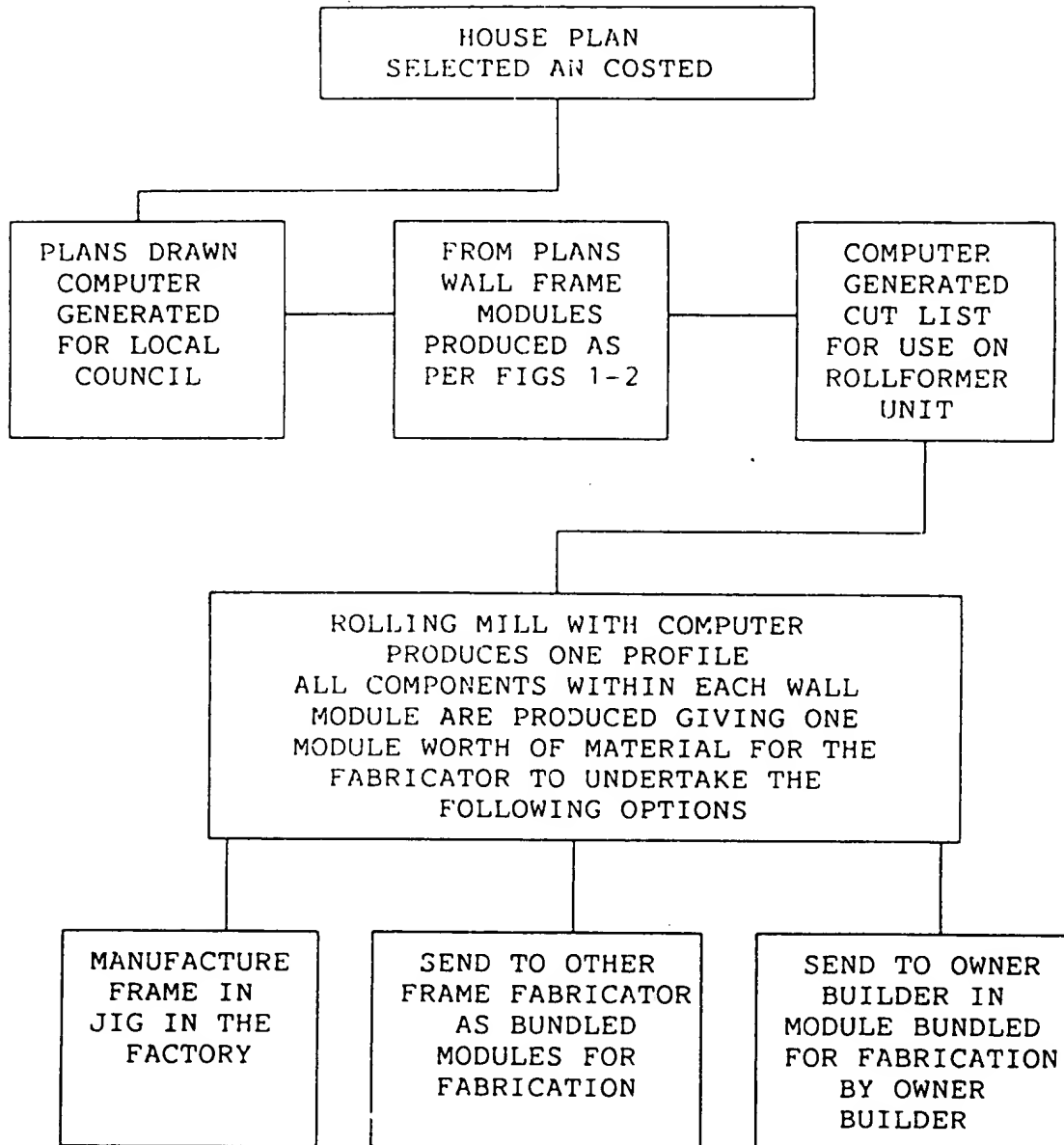




TABLE 3



THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A method of manufacture of framing for building construction which includes the steps of:

- 5           (i) designing a plan for a building frame having a plurality of frame members each having predetermined dimensions;
- (ii) manufacturing said building frame comprising said plurality of frame members which are each cut to conform with the dimensions of
- 10           step (i); and
- (iii) assembling each of said frame members to form said building frame.

2. A method as claimed in claim 1 wherein in step (i) a "cut list" is produced which may be produced as

15 a computer data file or manually inputted into a computer associated with a roll forming machine to produce said plurality of frame members.

3. A method as claimed in claim 1 or 2 wherein each of the frame members have the same or similar cross

20 sectional or transverse dimension.

4. A method as claimed in claim 3 wherein one or both ends of each frame member of the building frame may be further processed so that each frame member may be readily located in relation to each other in

25 abutting relationship or close proximity prior to assembly.

5. A method as claimed in claim 4 wherein each frame member has a channel shaped cross section.

6. A method as claimed in claim 3, 4 or 5 wherein channel members are provided with crimped ends so as to be retained by supporting frame members prior to step (iii).

5 7. A method as claimed in claim 5 wherein channel members have an attachment tab or protrusion to be welded to a broad surface of a supporting channel member.

8. A method as claimed in claim 5 wherein channel  
10 members have a pair of opposed tabs wherein each tab may be retained closely adjacent to a mating opposed flange of a supporting channel member prior to assembly.

9. A method as claimed in any preceding claim  
15 wherein after the relevant number of frame members are produced which correspond to an individual building frame they are then stacked or bundled together prior to assembly.

10. As method as claimed in claim 9 wherein the stack  
20 of frame members are subsequently placed in an assembly jig or welding jig for subsequent assembly.

11. A method as claimed in claim 9 wherein the bundle of frame members are transported to a fabrication site for assembly.

25 12. A method as claimed in claim 1 substantially as herein described with reference to the accompanying drawings.

13. A building frame when produced by the method of

any preceding claim.

14. A building frame formed by a plurality of frame members all having the same transverse dimension and cross sectional shape wherein one or both ends of each frame member are crimped or otherwise provided with end attachment means so as to be retained in close proximity or in abutting relationship with a supporting frame member.

15. A bundle of frame members in a relatively compact form wherein each of said frame members have been cut to a required length in accordance with dimensional data applicable to a wall frame.

DATED this Twenty-second day of December 1993

DIE-CRAFT ENGINEERING PTY LTD

By their Patent Attorneys

FISHER & KELLY

# ABSTRACT

A method of manufacture of framing for building construction which includes the steps of:

- (i) designing a plan for a building frame having a plurality of frame members each having predetermined dimensions;
- (ii) manufacturing said building frame comprising said plurality of frame members which are each cut to conform with the dimensions of step (i); and
- (iii) assembling each of said frame members to form said building frame.

FIG. 1 1/9

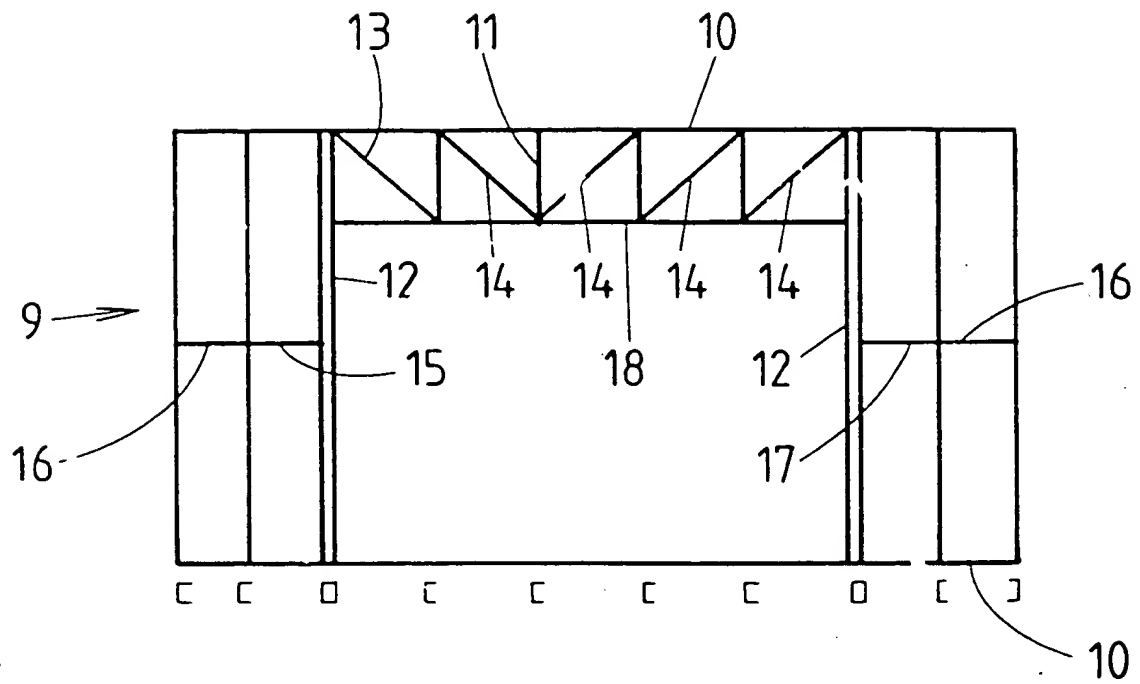
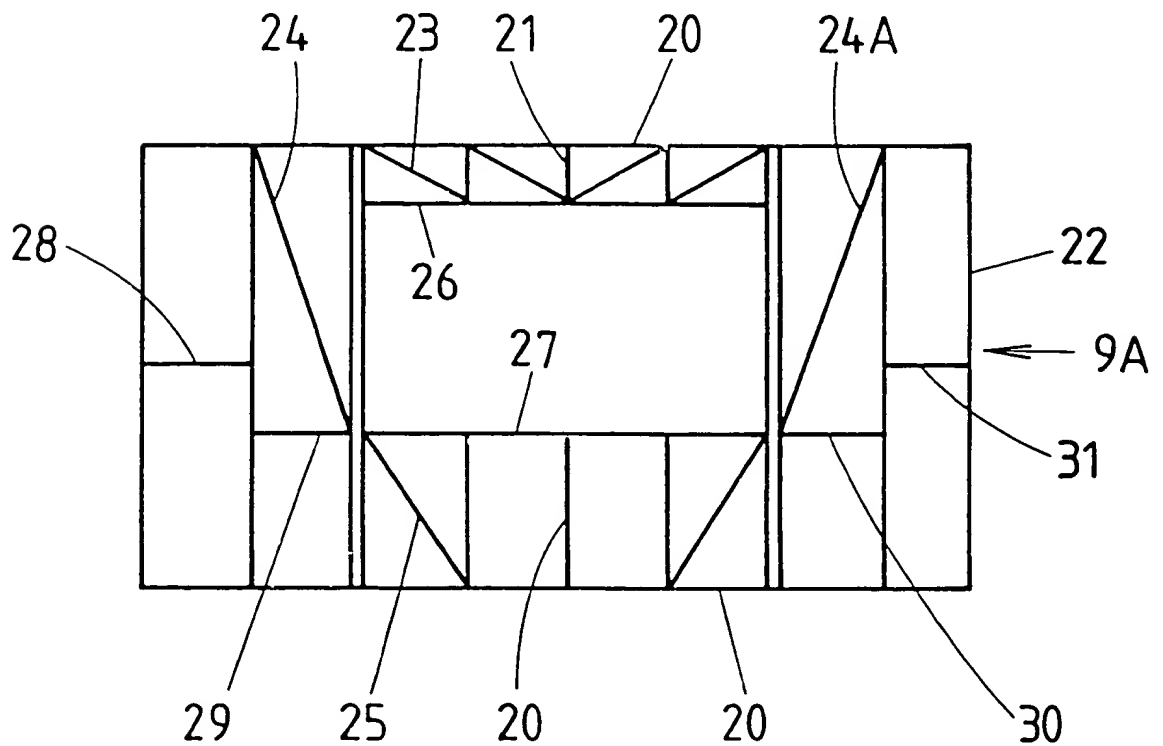
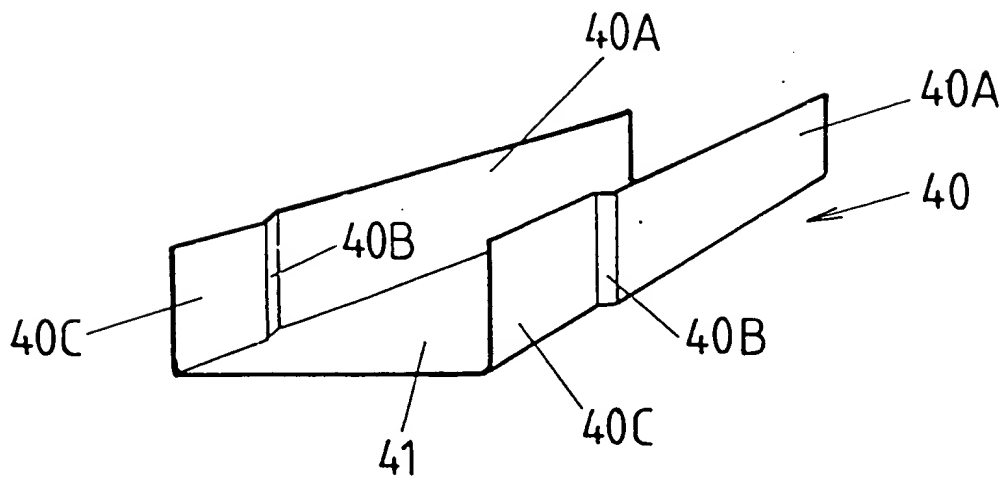


FIG. 2



2 / 9

FIG. 3



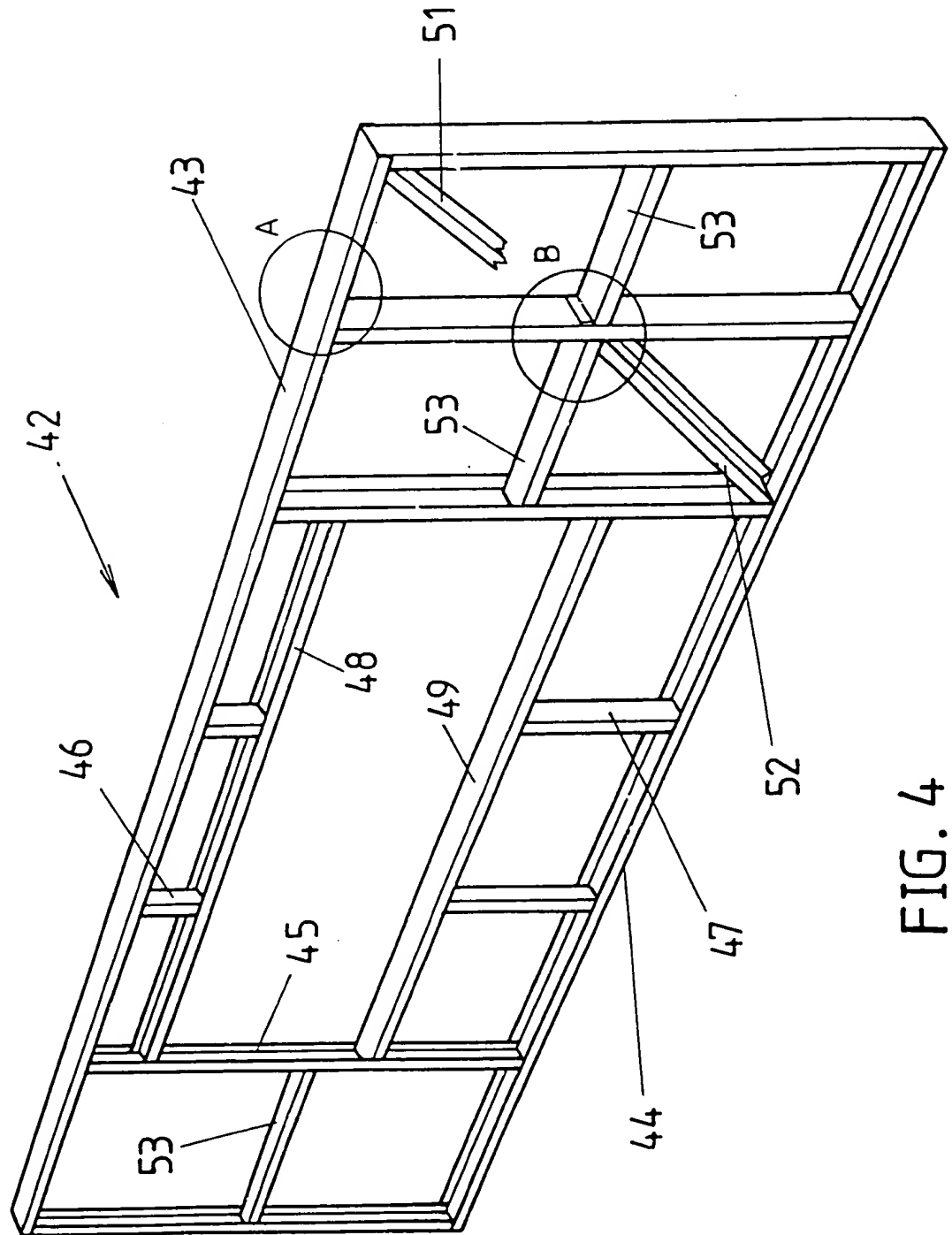
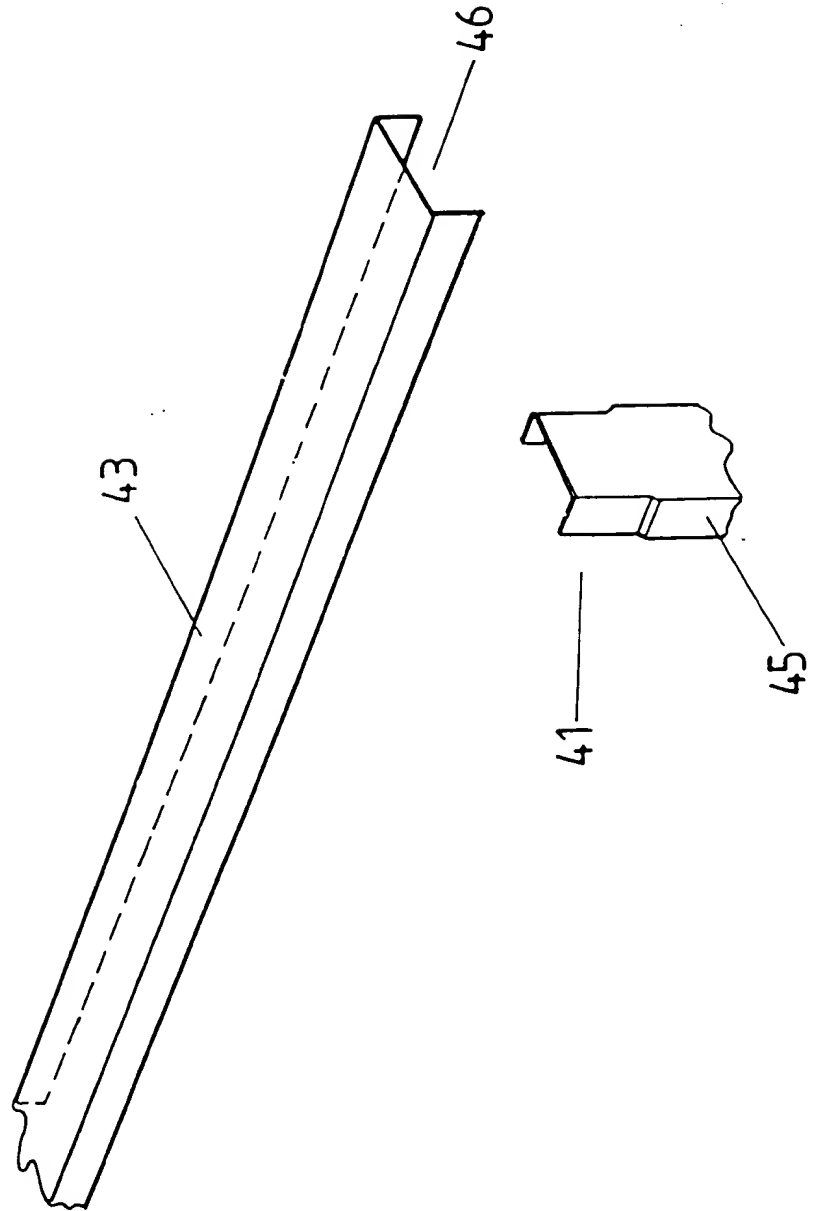


FIG. 4



FIG. 5



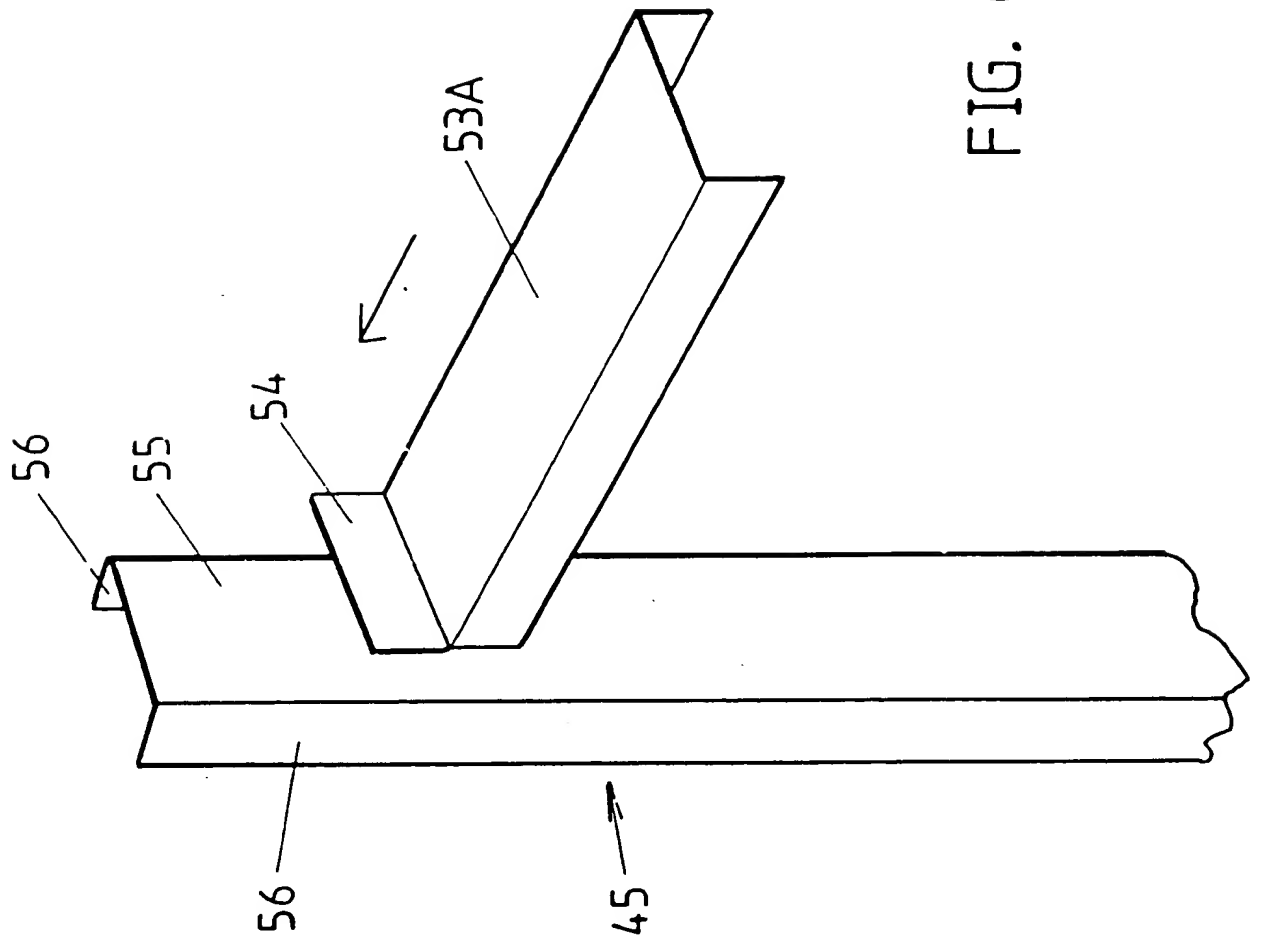
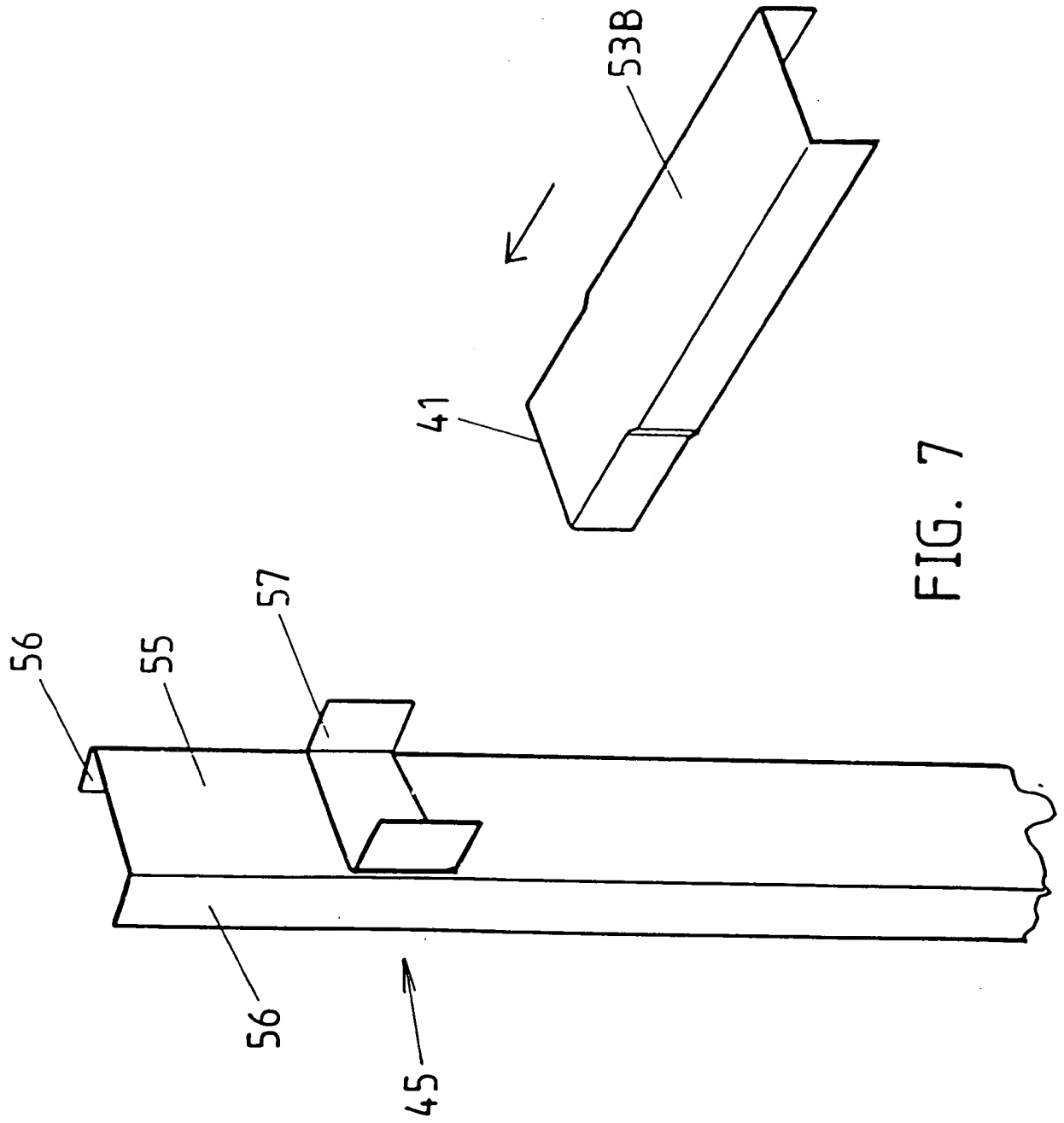


FIG. 6



7/9  
FIG. 8

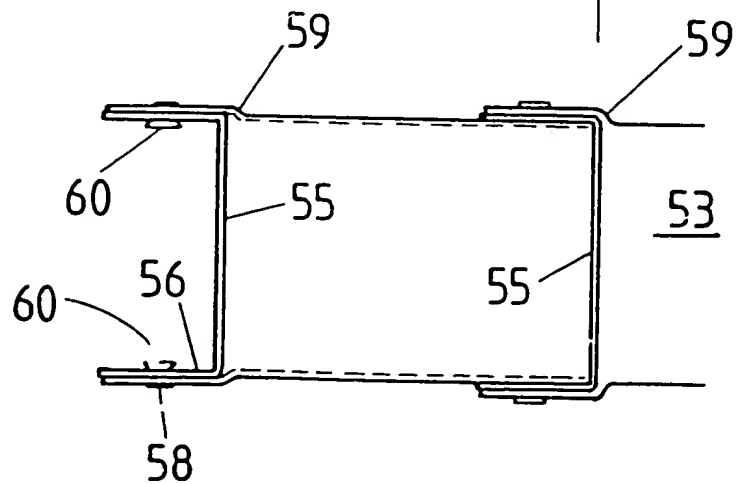
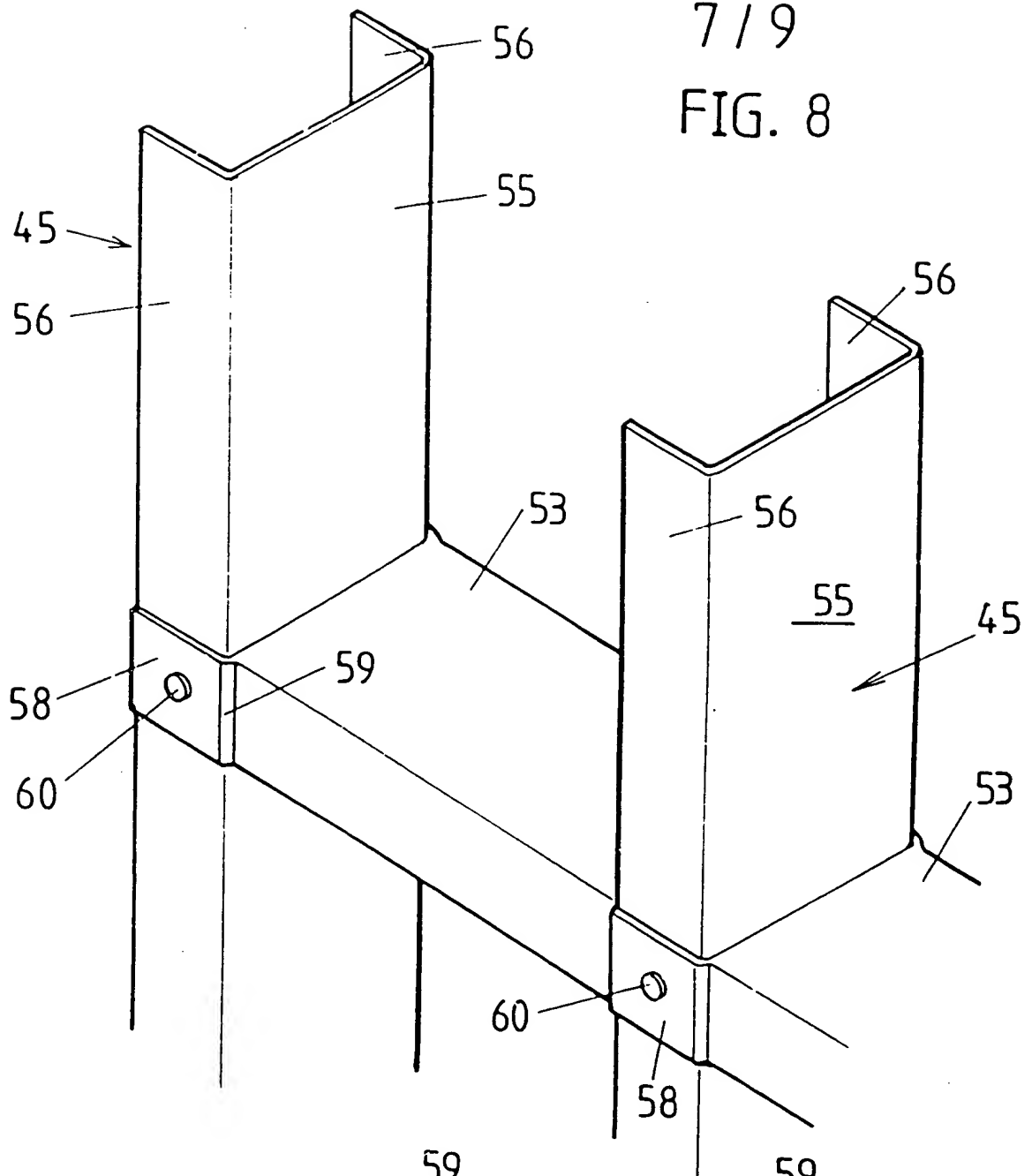


FIG. 9

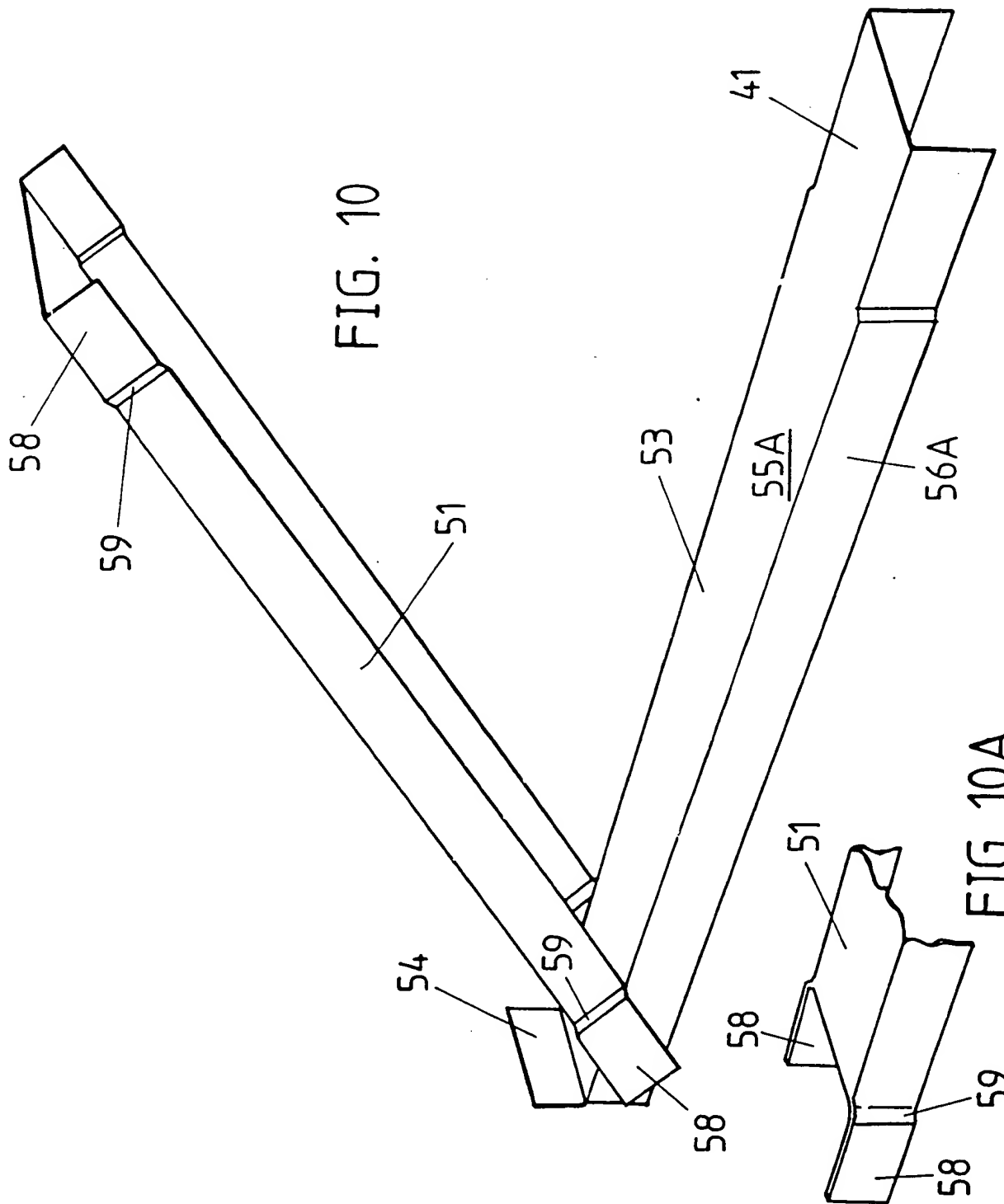


FIG. 11

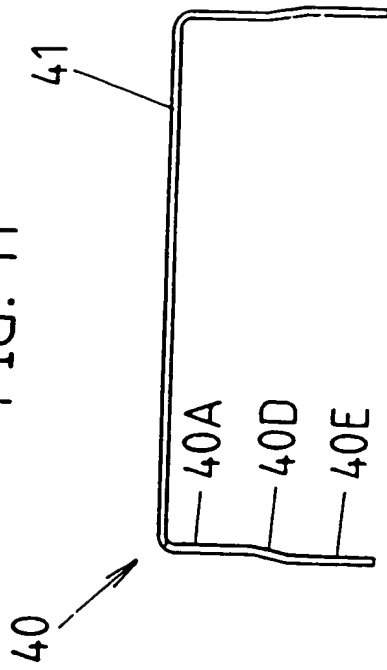


FIG. 12

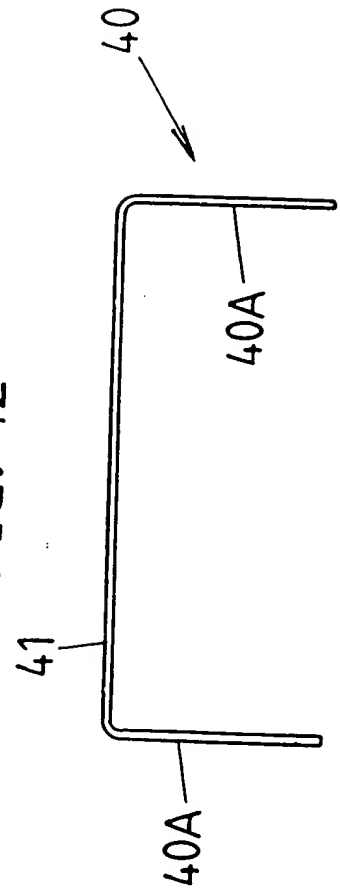


FIG. 13

